

# National Nuclear Security Administration Savannah River Site



**SRTE Human Performance Improvement**

## **Error and Flawed Defense Reporting & Analysis**

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National Nuclear Security Administration  
Safety Advisor, Savannah River Field Office



U.S. DEPARTMENT OF  
**ENERGY**

**NNSA**  
National Nuclear Security Administration

# National Nuclear Security Administration Savannah River Site



- In a Just Culture, “The problem is seldom the fault of an individual; it is the fault of the system. **Change the people without changing the system and the problems will continue.**” *Don Norman, Author, “The Design of Everyday Things”*
- Goal – to **identify what process/system changes are needed** prior to a significant event.
- Identification of process/system changes requires **full disclosure** of mistakes, errors, near misses, safety concerns, and events in order to facilitate learning from such occurrences and identifying opportunities for process and system improvement.
- Key principles of this program :
  - Self reporting of non-consequential errors and flawed defenses
  - No consequences for honest mistakes

# National Nuclear Security Administration Savannah River Site



## Examples of Error/Flawed Defense Entries

- **Modified IL-19 Gage for 1P not available**
- **E3S badge-out of patient during medical transport**
- **An operations procedure was submitted to the SM for review, but was incomplete**
- **Turnover sheet not completed**
- **Procedure can't be followed as written**
- **IPC written up incorrectly**
- **Before inspecting a run of 993's, I wrote down the serial numbers incorrectly**



Action Edit Query Block Record Field Help Window

Production - Site Tracking, Analysis, and Reporting (STAR)

**STAR** Site Tracking,  
Analysis, and Reporting

Instructions

Show List

Create New Record

Show Audit

Save

Exit

Initiation

Issue Evaluation

Actions (0)

Attachments (0)

Reviewers (0)

Comments (0)

Tracking No 2014 - CTS -

Sig Cat

Discovery Date

Initiated By: VOLDNESS, CHARLES M

Facility NNSA-SRFO-A...

ARRA Related NO

Doc Status OPEN

Issue Type

Sub-Issue Type NA

Resp Mgr/Person

Resp Designee

Topic + Assign a brief meaningful title which summarizes the issue.

Issue  
Description

+ Clearly define the issue. Include sufficient details such that others not directly involved are able to read the description and have a basic understanding of the issue.

Specific  
Requirements

+ Identify the specific requirement, expectation or condition that was deficient. Include specific references to the requirements document.

Program Doc No

NCR Req'd

NCR No

Project

Area

Building No

**Issue Validation**

Issue Analyst

Validate



# Site Tracking, Analysis and Reporting (STAR)

Oracle Fusion Middleware Forms Services - WebUtil - Windows Internet Explorer

http://starprod.srs.gov:8888/forms/frmservlet?config=starprod&tsepa

Google

Action Edit Query Block Record Field Help Window

Production - Site Tracking, Analysis, and Reporting (STAR)

AUD - QA Internal Audits  
BPL - B Punchlist Items (Design Change Impacts)  
DOE - DOE Issues Mgt System (IMS)  
ENG - Engineering Action Items  
ERROR - Non-consequential human action depart  
FDP - Facility Drill Program Items  
FEB - SRR FEB Report

Actions Show List Create New Record Show Audit Save Exit

Issues (0) Attachments (0) Reviewers (0) Comments (0)

Issue Cat  Discovery Date  Initiated By: VOLDNESS, CHARLES M

ARRA Related  Doc Status

Sub-Issue Type

Resp Designee  Mail

Topic + Assign a brief meaningful title which summarizes the issue.

Issue Description + Clearly define the issue. Include sufficient details such that others not directly involved are able to read the description and have a basic understanding of the issue.

Specific Requirements + Identify the specific requirement, expectation or condition that was deficient. Include specific references to the requirements document.

Program Doc No

Project

Area  Building No

Special QA Req't

NCR Req'd  NCR No

Issue Validation

Issue Analyst  Validate

Review Board  Add Review



Production - Site Tracking, Analysis, and Reporting (STAR)

**STAR** Site Tracking, Analysis, and Reporting

Instructions

Show List

Create New Record

Show Audit

Save

Exit

Initiation

Issue Evaluation

Actions (0)

Attachments (0)

Reviewers (0)

Comments (0)

Tracking No 2014 - CTS -

Sig Cat

Discovery Date

Initiated By: VOLDNESS, CHARLES M

Facility NNSA-SRFO:A...

ARRA Related NO

Doc Status OPEN

Issue Type

Sub-Issue Type NA

Resp Mgr/Person

Mail

Resp Designee

Mail

Topic + Assign a brief meaningful title which summarizes the issue.

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Program Doc No

NCR Req'd

NCR No

Project

Area

Building No

**Issue Validation**

Issue Analyst

Validate



Oracle Fusion Middleware Forms Services - WebUtil - Windows Internet Explorer

http://starprod.srs.gov:8888/forms/frmservlet?config=starprod& Google

Action Edit Query Block Record Field Help Window

Production - Site Tracking, Analysis, and Reporting (STAR)

# STAR

Site Tracking, Analysis, and Reporting

Instructions Show List Create New Record Show Audit Save

Initiation Issue Evaluation Actions (0) Attachments (0) Reviewers (0) Comments (0)

Tracking No  Sig Cat  Issue Type

Topic + Assign a brief meaningful title which summarizes the issue.

## Functional Area Codes

(\* Primary Code)

Add Primary Code Add Code Delete Code Code Details

## Error Precursor(s)/Flawed Defense(s)/ Latent Org. Weakness(es)

Add Code Delete Code Code Details

### Site Tracking, Analysis, and Reporting (STAR)

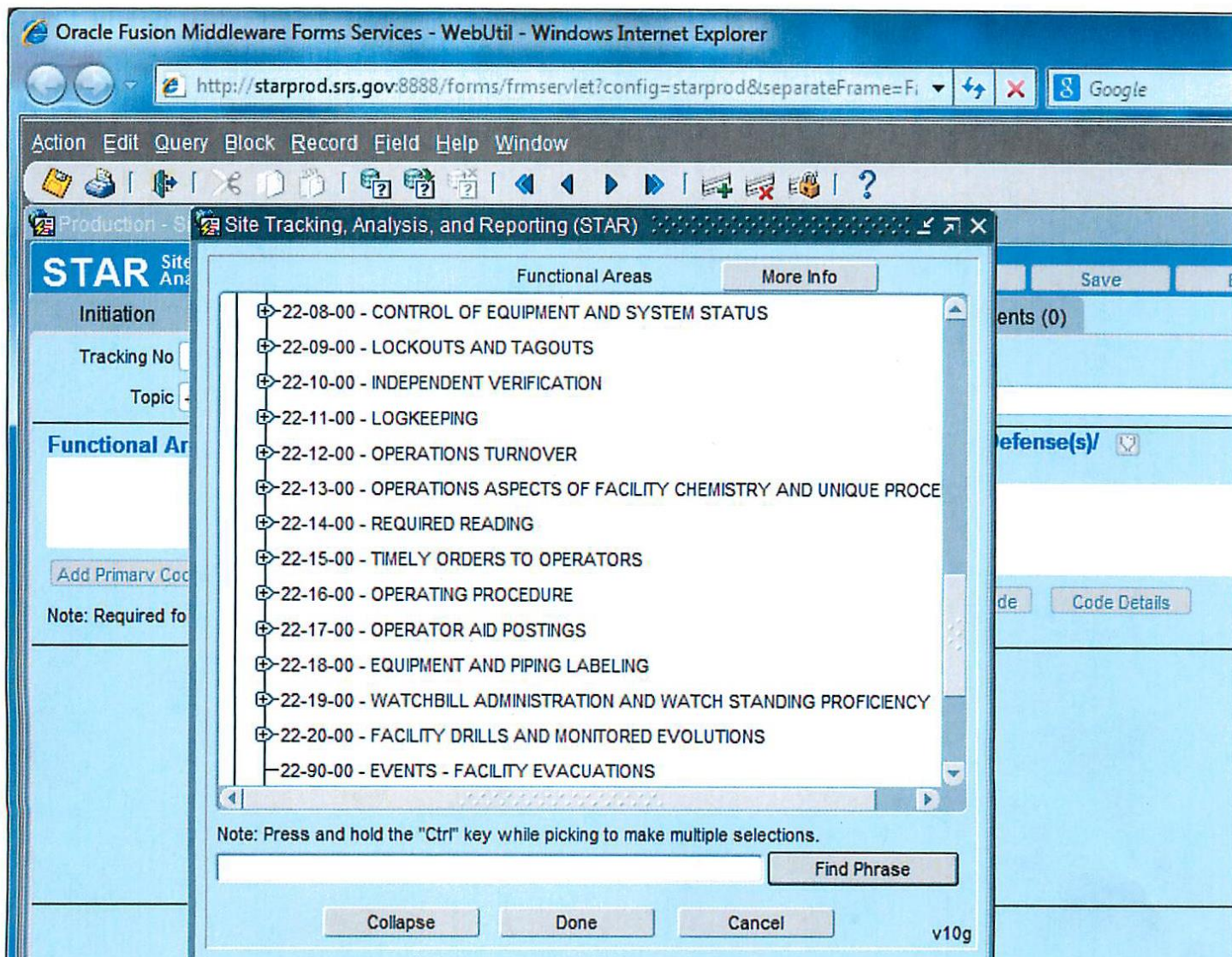
Functional Areas More Info

- 10-00-00 - Maintenance
- 11-00-00 - Radiation Protection
- 12-00-00 - Fire Protection
- 13-00-00 - Emergency Preparedness
- 15-00-00 - Nuclear Criticality Safety
- 16-00-00 - Testing
- 18-00-00 - Safeguards And Security
- 19-00-00 - Packaging And Transportation
- 20-00-00 - Occupational Safety And Health
- 21-00-00 - Procurement
- 22-00-00 - Conduct Of Operations
- 23-00-00 - Liquid Waste Operations (LWO) Project Management
- 24-00-00 - Solid Waste Management

# SRS Functional Areas

FA	Title
<a href="#"><u>01</u></a>	<a href="#"><u>DESIGN</u></a>
<a href="#"><u>02</u></a>	<a href="#"><u>CONSTRUCTION</u></a>
<a href="#"><u>03</u></a>	<a href="#"><u>MANAGEMENT SYSTEMS</u></a>
<a href="#"><u>04</u></a>	<a href="#"><u>TRAINING AND QUALIFICATION</u></a>
<a href="#"><u>06</u></a>	<a href="#"><u>SAFETY DOCUMENTATION</u></a>
<a href="#"><u>07</u></a>	<a href="#"><u>ENVIRONMENTAL PROTECTION</u></a>
<a href="#"><u>08</u></a>	<a href="#"><u>QUALITY ASSURANCE</u></a>
<a href="#"><u>09</u></a>	<a href="#"><u>CONFIGURATION MANAGEMENT</u></a>
<a href="#"><u>10</u></a>	<a href="#"><u>MAINTENANCE</u></a>
<a href="#"><u>11</u></a>	<a href="#"><u>RADIATION PROTECTION</u></a>
<a href="#"><u>12</u></a>	<a href="#"><u>FIRE PROTECTION</u></a>
<a href="#"><u>13</u></a>	<a href="#"><u>EMERGENCY PREPAREDNESS</u></a>
<a href="#"><u>15</u></a>	<a href="#"><u>NUCLEAR CRITICALITY SAFETY</u></a>
<a href="#"><u>16</u></a>	<a href="#"><u>TESTING</u></a>
<a href="#"><u>18</u></a>	<a href="#"><u>SAFEGUARDS AND SECURITY</u></a>
<a href="#"><u>19</u></a>	<a href="#"><u>PACKAGING AND TRANSPORTATION</u></a>
<a href="#"><u>20</u></a>	<a href="#"><u>OCCUPATIONAL SAFETY AND HEALTH</u></a>
<a href="#"><u>21</u></a>	<a href="#"><u>PROCUREMENT</u></a>
<a href="#"><u>22</u></a>	<a href="#"><u>CONDUCT OF OPERATIONS</u></a>
<a href="#"><u>24</u></a>	<a href="#"><u>WASTE MANAGEMENT</u></a>
<a href="#"><u>25</u></a>	<a href="#"><u>CHEMICAL SAFETY AND LIFECYCLE MANAGEMENT</u></a>
<a href="#"><u>27</u></a>	<a href="#"><u>WORK PLANNING AND CONTROL</u></a>







Oracle Fusion Middleware Forms Services - WebUtil - Windows Internet Explorer

http://starprod.srs.gov:8388/forms/frmservlet?config=starprod& Google

Action Edit Query Block Record Field Help Window

Production - Site Tracking, Analysis, and Reporting (STAR)

# STAR

Site Tracking, Analysis, and Reporting

Instructions Show List Create New Record Show Audit Save Exit

Initiation Issue Evaluation Actions (0) Attachments (0) Reviewers (0) Comments (0)

Tracking No  Sig Cat  Issue Type  UCHII Environment

Topic  + Assign a brief meaningful title which summarizes the issue.

Functional Area Codes (\* Primary Code)

Add Primary Code Add Code Delete Code Code Details

Error Precursor(s)/Flawed Defense(s)/ Latent Org. Weakness(es)

Add Code Delete Code Code Details

Site Tracking, Analysis, and Reporting (STAR)

Functional Areas

More Info

- 19-00-00 - Packaging And Transportation
- 20-00-00 - Occupational Safety And Health
- 21-00-00 - Procurement
- 22-00-00 - Conduct Of Operations
  - 22-01-00 - OPERATIONS ORGANIZATION AND ADMINISTRATION
    - 22-01-01 - OPERATIONS POLICIES
    - 22-01-02 - RESOURCES
    - 22-01-03 - MONITORING OF OPERATIONS PERFORMANCE
    - 22-01-04 - ACCOUNTABILITY
    - 22-01-05 - MANAGEMENT TRAINING
    - 22-01-06 - PLANNING FOR SAFETY
  - 22-02-00 - SHIFT ROUTINES AND OPERATING PRACTICES
  - 22-03-00 - CONTROL AREA ACTIVITIES

Print



Oracle Fusion Middleware Forms Services - WebUtil - Windows Internet Explorer

http://starprod.srs.gov:8888/forms/frmservlet?config=starprod&separateFrame=False&otherparams=idsn=PT11+fo

Action Edit Query Block Record Field Help Window

Production - Site Tracking, Analysis, and Reporting (STAR)

# STAR Site Tracking, Analysis, and Reporting

Instructions Show List Create New Record Show Audit Save

Initiation Issue Evaluation Actions (0) Attachments (0) Reviewers (0) Comments (0)

Tracking No  Sig Cat  Issue Type

Topic + Assign a brief meaningful title which summarizes the issue.

Functional Area Codes (\* Primary Code)

Error Precursor(s)/Flawed Defense(s)/ Latent Org. Weakness(es)

Site Tracking, Analysis, and Reporting (STAR)

Functional Areas More Info

- 22-12-00 - OPERATIONS TURNOVER
- 22-13-00 - OPERATIONS ASPECTS OF FACILITY CHEMISTRY AND UNIQUE PROCE
- 22-14-00 - REQUIRED READING
- 22-15-00 - TIMELY ORDERS TO OPERATORS
- 22-16-00 - OPERATING PROCEDURE
  - 22-16-01 - PROCEDURE DEVELOPMENT
  - 22-16-02 - PROCEDURE CONTENT
  - 22-16-03 - PROCEDURE CHANGES AND REVISIONS
  - 22-16-04 - PROCEDURE APPROVAL
  - 22-16-05 - PROCEDURE REVIEW
  - 22-16-06 - PROCEDURE AVAILABILITY
  - 22-16-07 - PROCEDURE USE
- 22-17-00 - OPERATOR AID POSTINGS
- 22-18-00 - EQUIPMENT AND PIPING LABELING

Code Delete Code Code Details



Action Edit Query Block Record Field Help Window

Production - Site Tracking, Analysis, and Reporting (STAR)

# STAR

Site Tracking, Analysis, and Reporting

Instructions Show List Create New Record Show Audit Save Exit

Initiation Issue Evaluation Actions (0) Attachments (0) Reviewers (0) Comments (0)

Tracking No  Sig Cat  Issue Type  **UCNI Environment**

Topic + Assign a brief meaningful title which summarizes the issue.

## Functional Area Codes

(\* Primary Code)

Add Primary Code Add Code Delete Code Code Details

Note: Required for SC 1, 2, 3, 4; SC 1, 2, 3 to level C; SC 4 to level B

## Error Precursor(s)/Flawed Defense(s)/Latent Org. Weakness(es)

Add Code Delete Code Code Details

Note: Optional

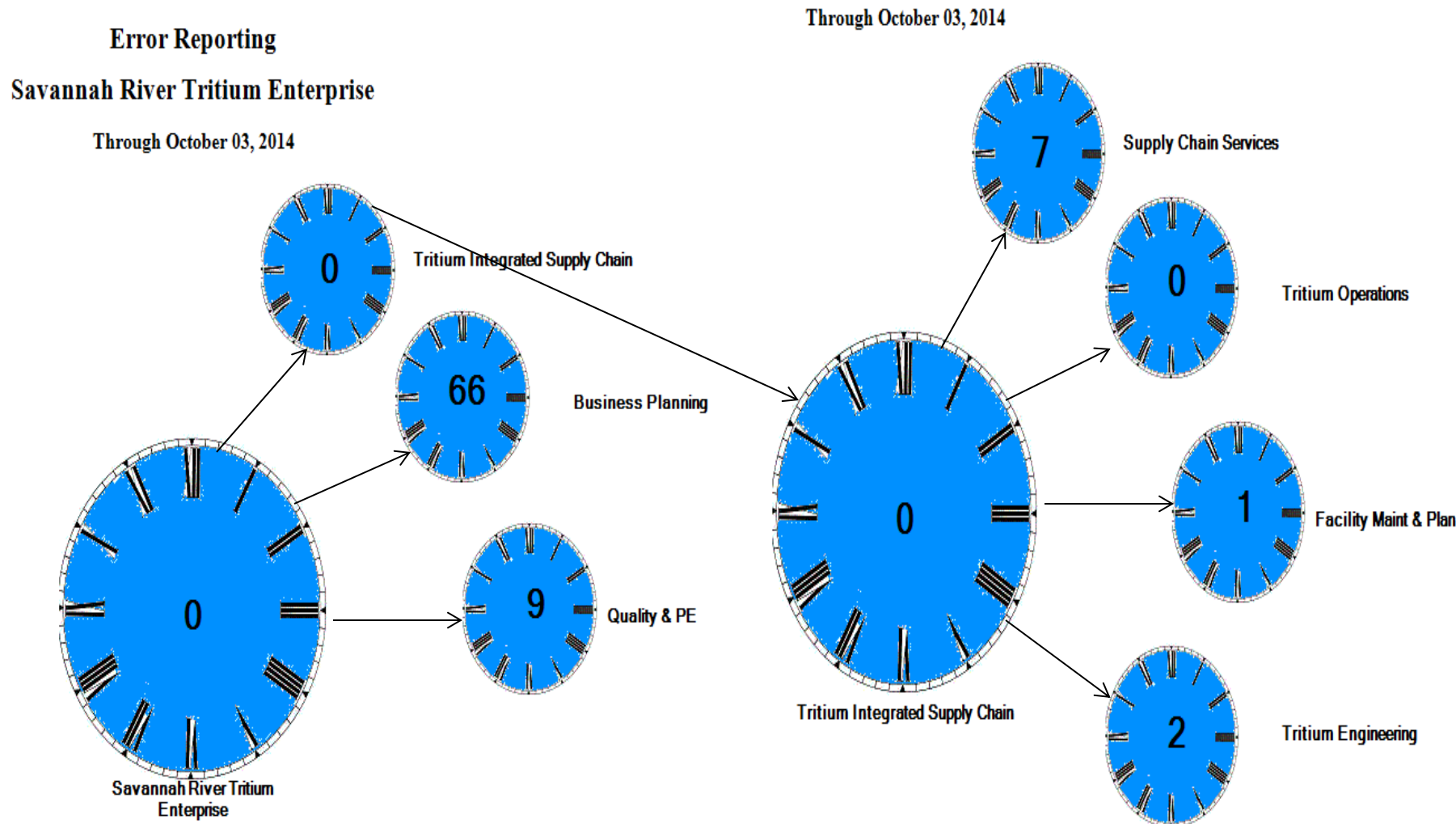
## Error Precursor(s)/Flawed Defense(s)/Latent Org. Weakness(es)

Definitions

- E - Error Precursors; Unfavorable factors embedded in the job site that increase the chances of error during the performance of a specific task.
- EH - Human Nature; Generic traits, dispositions, and limitations common to all human beings that may incline individuals to err under unfavorable conditions.
  - EH01 - Stress; Mind's response to the perception of a threat to one's health, safety, self-esteem, or livelihood if task is not performed.
  - EH02 - Habit patterns; Ingrained or automated pattern of actions attributable to repetitive nature of a well-practiced task; inclination to perform a task in a certain way.
  - EH03 - Assumptions; Suppositions made without verification of facts, usually based on perception of recent experience; provoked by a stimulus.
  - EH04 - Complacency/overconfidence; A "Pollyanna" effect leading to a presumption that all is well in the world and that everything will turn out fine.
  - EH05 - Mind-set; Tendency to "see" only what the mind is tuned to see (intention); preconceived idea. Information that does not fit a mind-set is ignored.
  - EH06 - Inaccurate risk perception; Personal appraisal of hazards and uncertainty based on either incomplete information or assumptions.
  - EH07 - Mental shortcuts (biases); Tendency to look for or see patterns in unfamiliar situations; application of thumb rules or ?habits.
  - EH08 - Limited short-term memory; Forgetfulness; inability to accurately attend to more than 2 or 3 channels of information (or 5 to 7).
- EI - Individual Capabilities; Unique mental, physical, and emotional abilities of a particular person that fail to match the demands of the specific task.

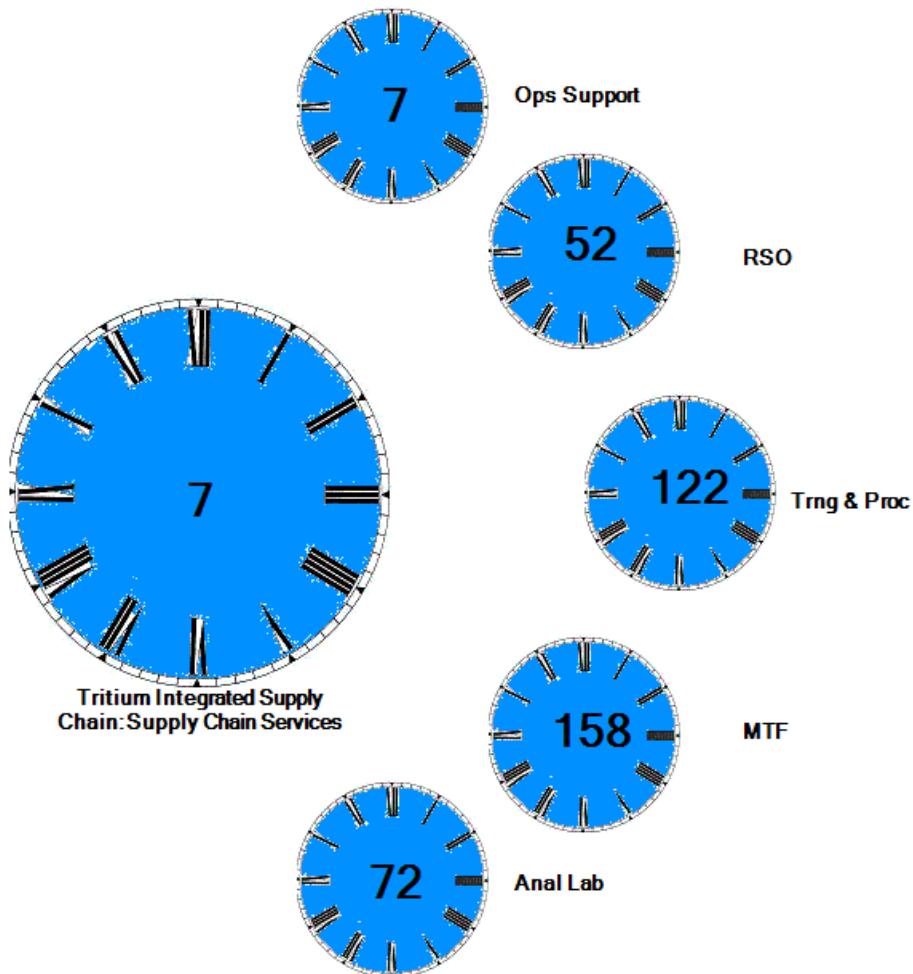


# Error Clock (Days since last error reported)



# Error Clock - SCS

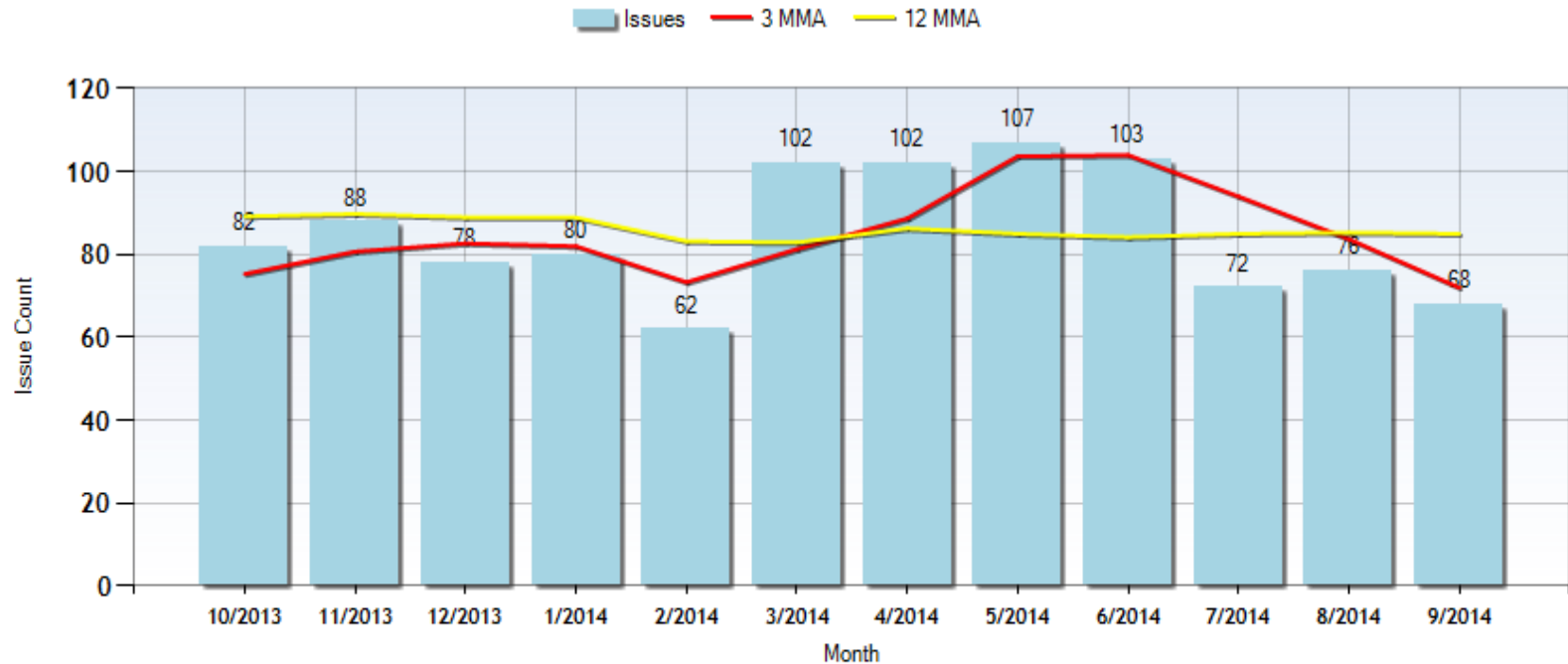
Through October 03, 2014





# Error / Flawed Defense Reporting Past 12 Months

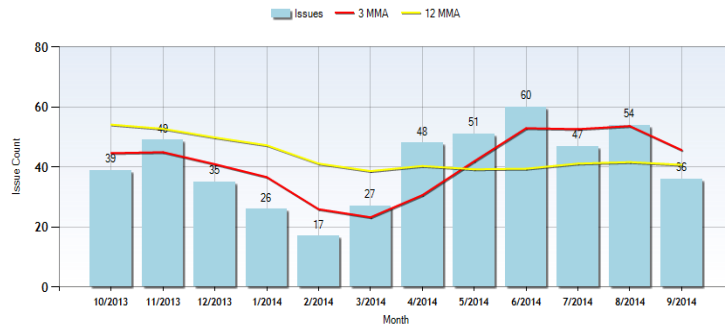
## Error / Flawed Defense Reporting



	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14
Issue Cnt	82	88	78	80	62	102	102	107	103	72	76	68
3 MMA	75	81	83	82	73	81	89	104	104	94	84	72
12 MMA	89	90	89	89	83	83	86	85	84	85	85	85

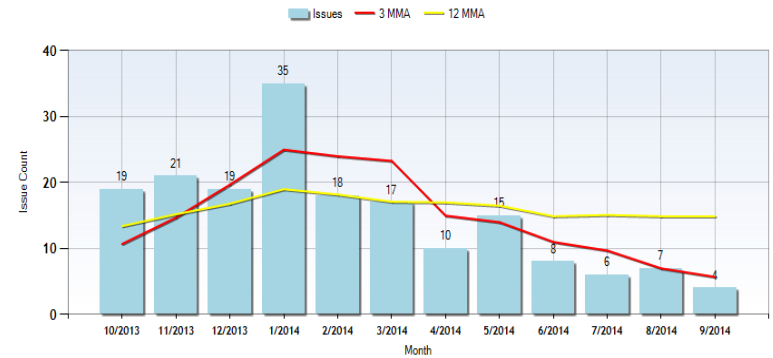
# Error / Flawed Defense Reporting (Trend -- 1 year)

## Facility Operations



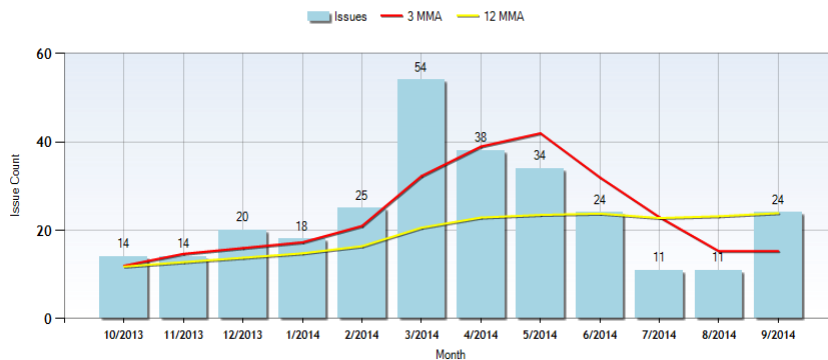
	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14
Issue Cnt	39	49	35	26	17	27	48	51	60	47	54	36
3 MMA	45	45	41	37	26	23	31	42	53	53	54	46
12 MMA	54	53	50	47	41	39	40	39	40	41	42	41

## Maintenance



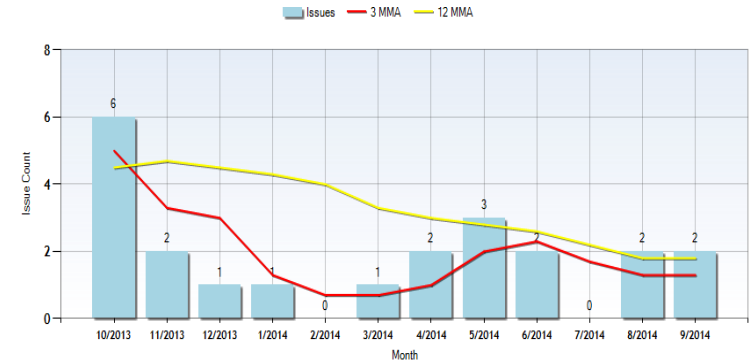
	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14
Issue Cnt	19	21	19	35	18	17	10	15	8	6	7	4
3 MMA	11	15	20	25	24	23	15	14	11	10	7	6
12 MMA	13	15	17	19	18	17	17	17	15	15	15	15

## Engineering



	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14
Issue Cnt	14	14	20	18	25	54	38	34	24	11	11	24
3 MMA	12	15	16	17	21	32	39	42	32	23	15	15
12 MMA	12	13	14	15	16	21	23	24	24	23	23	24

## Support Services

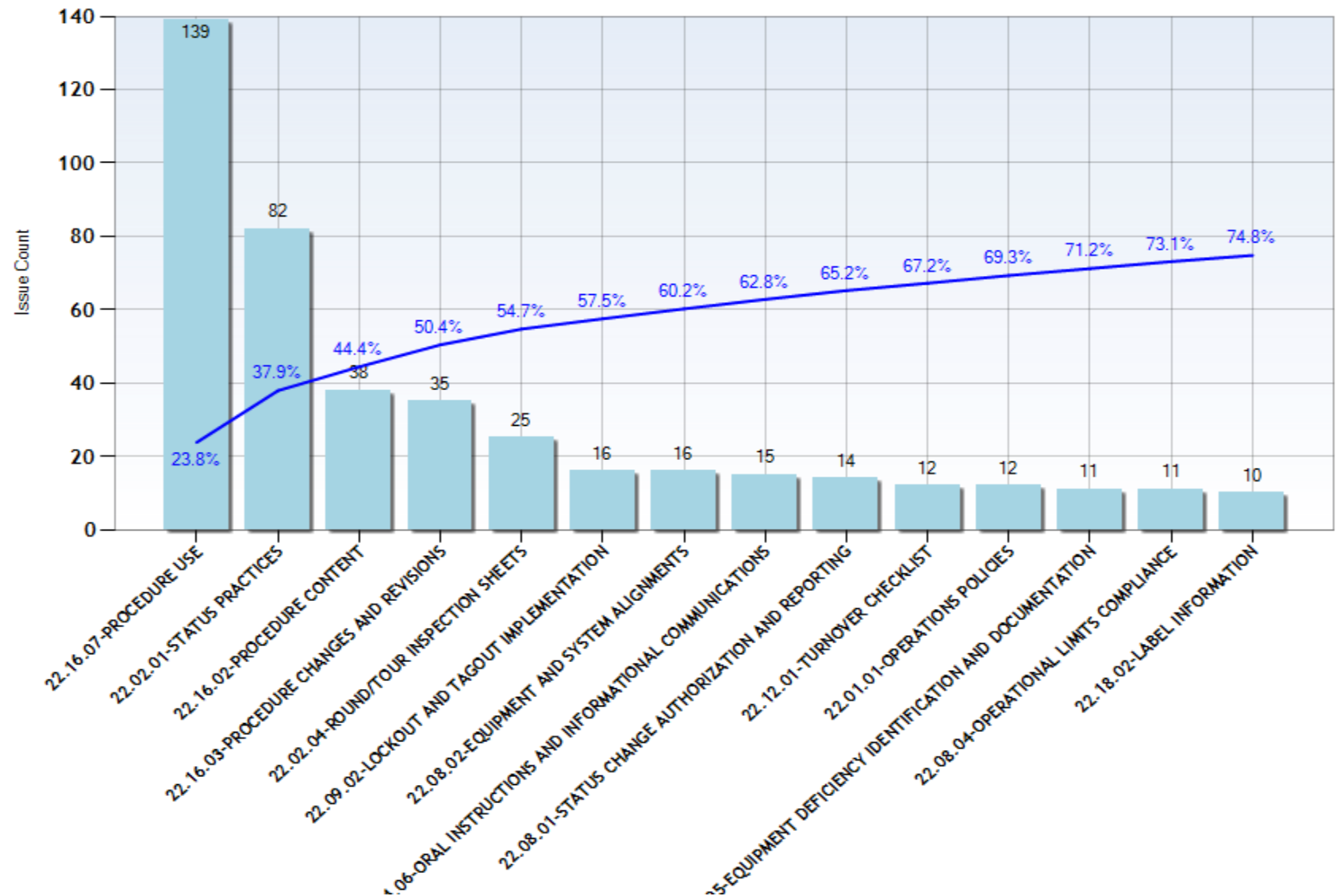


	10/13	11/13	12/13	1/14	2/14	3/14	4/14	5/14	6/14	7/14	8/14	9/14
Issue Cnt	6	2	1	1	0	1	2	3	2	0	2	2
3 MMA	5	3	3	1	1	1	1	2	2	2	1	1
12 MMA	5	5	5	4	4	3	3	3	3	2	2	2



# Top 15 at the ConOps Sub-element level (Past 12 months)

Issues By Primary Functional Area Code, Element, & Sub-Element Pareto Chart (Top 15)



# National Nuclear Security Administration

## Savannah River Site

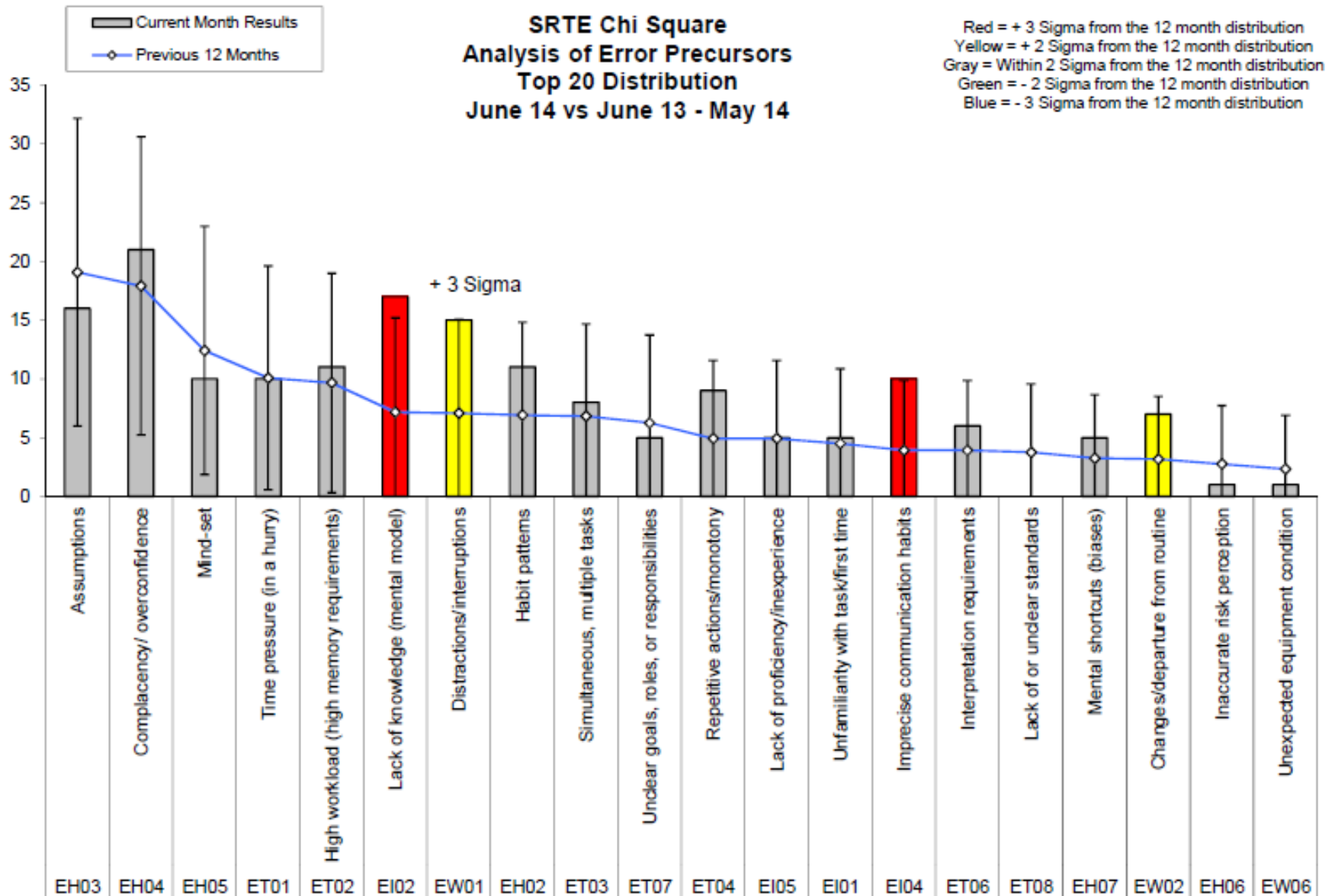


### ConOps Sub-Elements

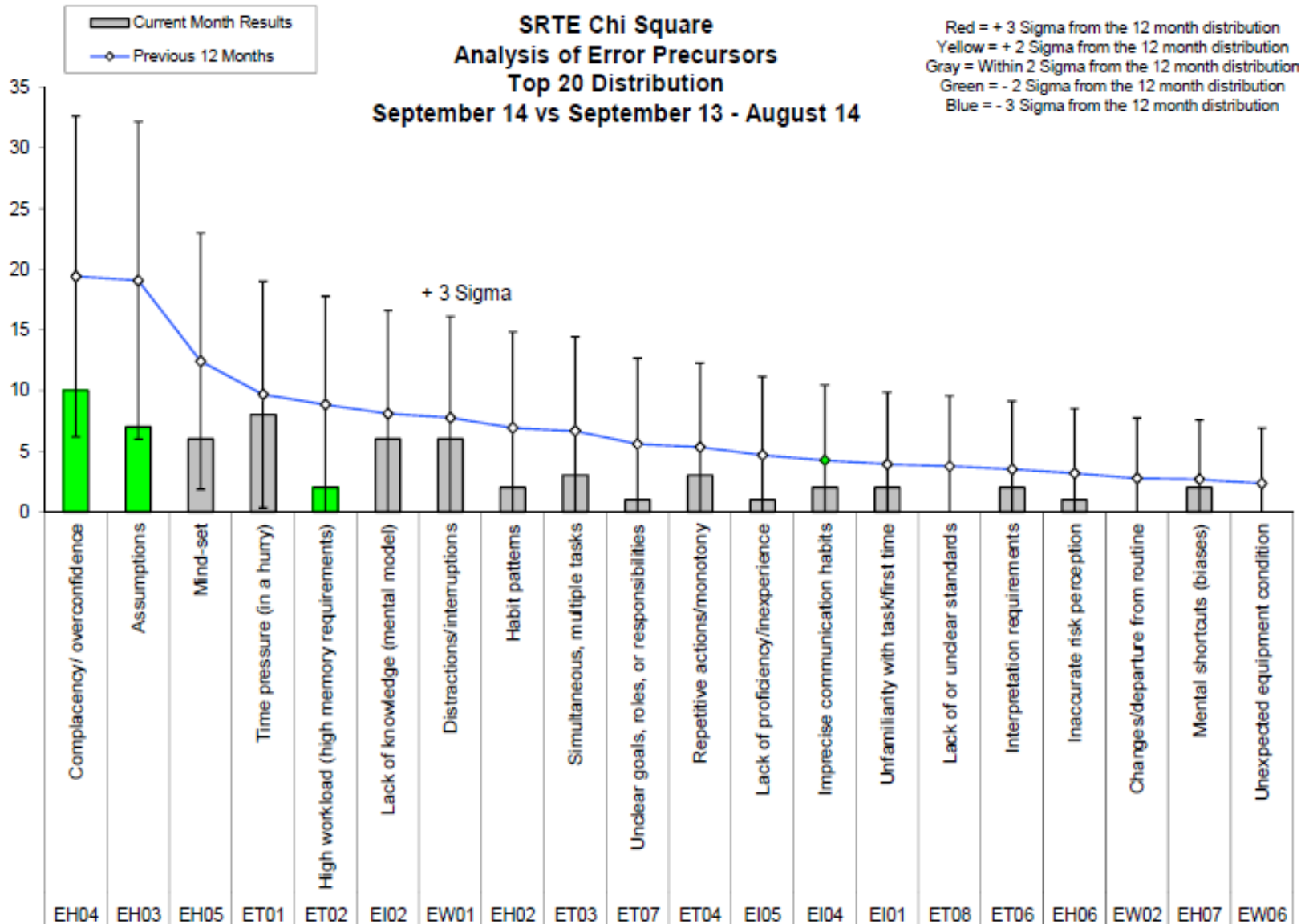
22.16.00	<b>OPERATING PROCEDURE</b>	Procedure are developed for all expected operating situations and evolutions, with a consistent format, and in a clear and lucid style.[Procedure Manual 2S, 1.1]
22.16.01	<b>PROCEDURE DEVELOPMENT</b>	Programs are established and implemented for development, approval, revision, review, issuance, and cancellation of Procedures. Procedures exist that govern the receipt, control, use, and modification of procedures. [S/RID 09.03.01.023][Procedure Manual 1B, MRP 3.32, 3.27] [Procedure Manual 2S, 1.1]
22.16.02	<b>PROCEDURE CONTENT</b>	The scope and applicability of individual procedures should be readily apparent. To enhance rapid retrieval, emergency procedures should be distinguishable from other procedures. Procedures incorporate appropriate information from applicable source documents, such as facility design documents, safety analysis documents, and vendor technical manuals. Prerequisites and initial conditions are detailed. Definitions used in the procedure are explained. Procedures are easily understood and actions are clearly stated. Procedures should contain only one action per step. Procedure Manuals contain sufficient but not excessive detail. The skill level, experience, and training of the procedure users are considered writing of the procedure. Warnings, notes, and cautions are easily identifiable and do not contain action statements.
22.16.03	<b>PROCEDURE CHANGES AND REVISIONS</b>	Procedure changes (on-the-spot modifications to a procedure , which do not require re-typing and reissue) and revisions (new re-typed, re-approved versions of the procedure) are documented and approved. [S/RID 09.03.01.042][Procedure Manual 2S, 1.1]
22.16.04	<b>PROCEDURE APPROVAL</b>	Procedures are approved by appropriate levels of authority. [S/RID 09.03.01.043][Procedure Manual 2S, 1.1, 5.4][ Procedure Manual 1B, MRP 3.27]
22.16.05	<b>PROCEDURE REVIEW</b>	Operating and maintenance procedures are validated for use-ability and correctness by walk-downs in the facility. The frequency of periodic reviews is based on a schedule. Procedure reviews include comparison of the procedure to source documents. Reviews are conducted and documented by members of organizations that are affected by the procedure, such as those specifically identified to accomplish steps in the procedure, and those that must modify their activities to support the procedure. [S/RID 09.03.01.044][Procedure Manual 2S, 1.1][Procedure Manual 1B, MRP 3.27]
22.16.06	<b>PROCEDURE AVAILABILITY</b>	Controlled copies of all operating procedures are maintained and accessible to the procedure user and supervisor. Working copies of controlled documents are available for use during procedure execution. Controlled alarm response procedures are easily available to those procedure users responsible for responding to alarms. [S/RID 09.03.01.045-047][Procedure Manual 1B, MRP 3.37][ Procedure Manual 2S, 1.1, 1.3]
22.16.07	<b>PROCEDURE USE</b>	Operations are conducted in accordance with written procedures that reflect the facility design basis. Procedure users are trained in the use of operating procedure. Procedure users are aware that they are authorized to take whatever action is necessary during emergency conditions to place the facility in a safe condition and to protect equipment, personnel and public safety without first initiating a procedure change. [S/RID 09.03.01.048-049][Procedure Manual 2S 1.1, 1.3, 4.4][Procedure Manual 1B, MRP 3.27]



# STAR Error Precursor Analysis - June, 2014

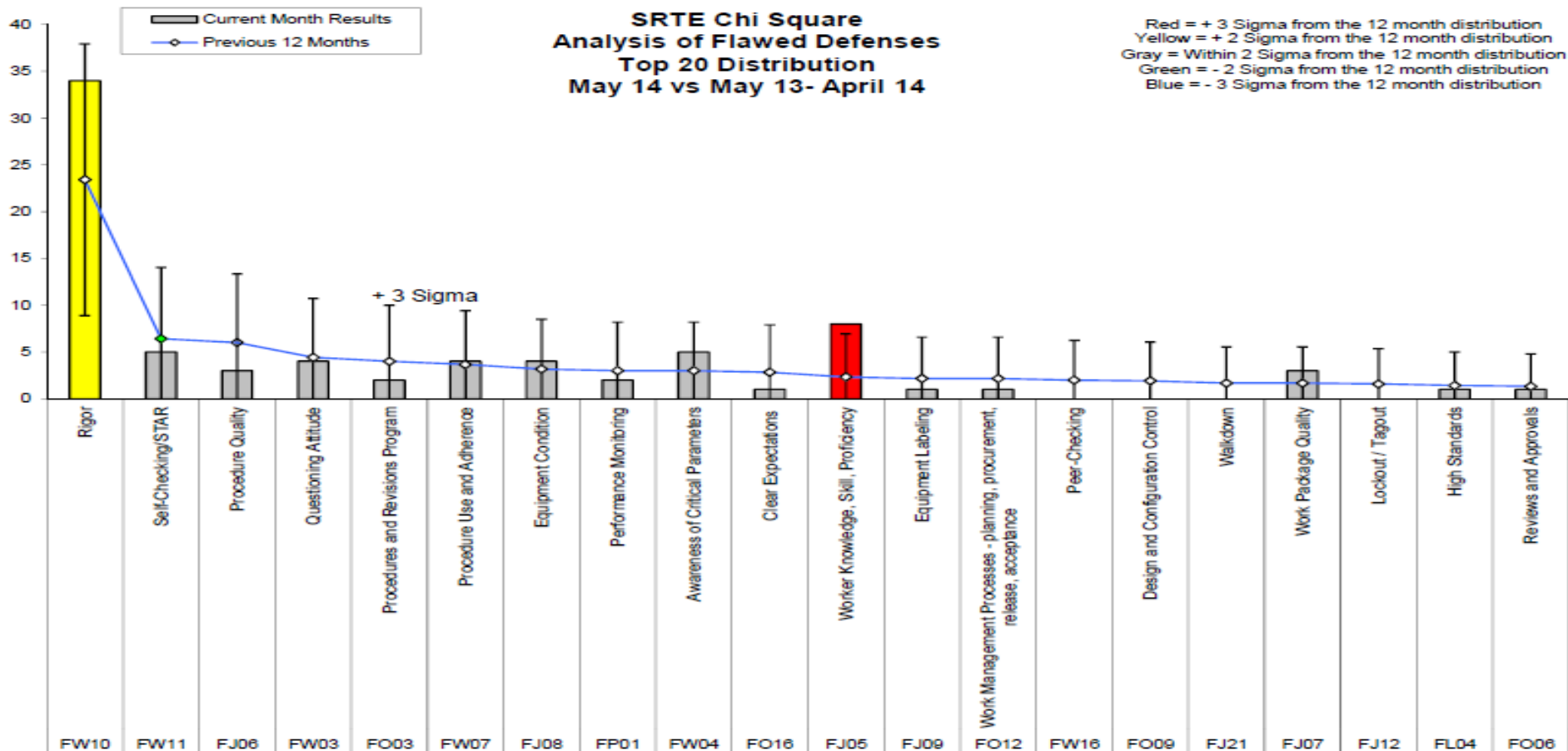


# STAR Error Precursor Analysis - September, 2014

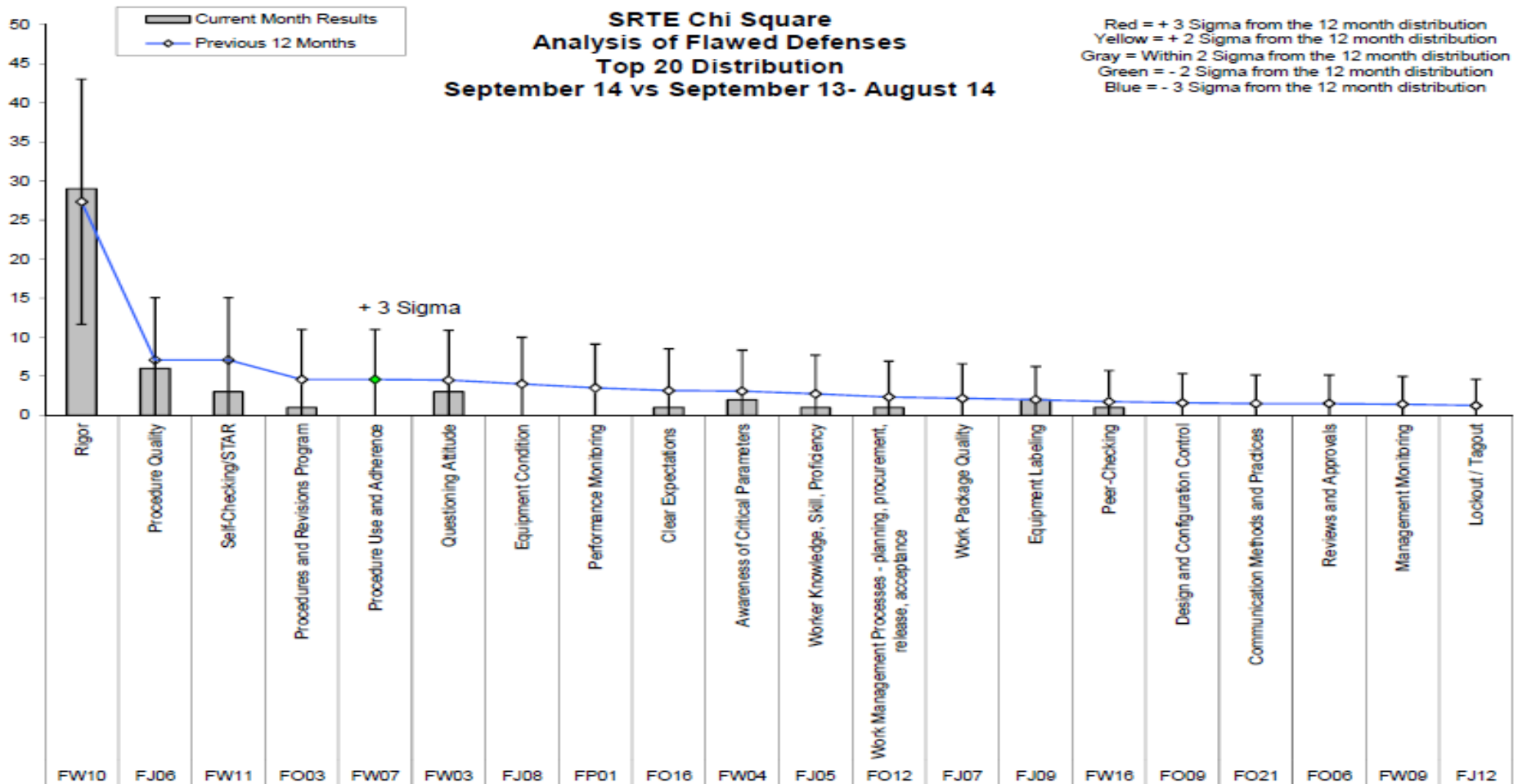




# STAR Flawed Defense Analysis – June, 2014

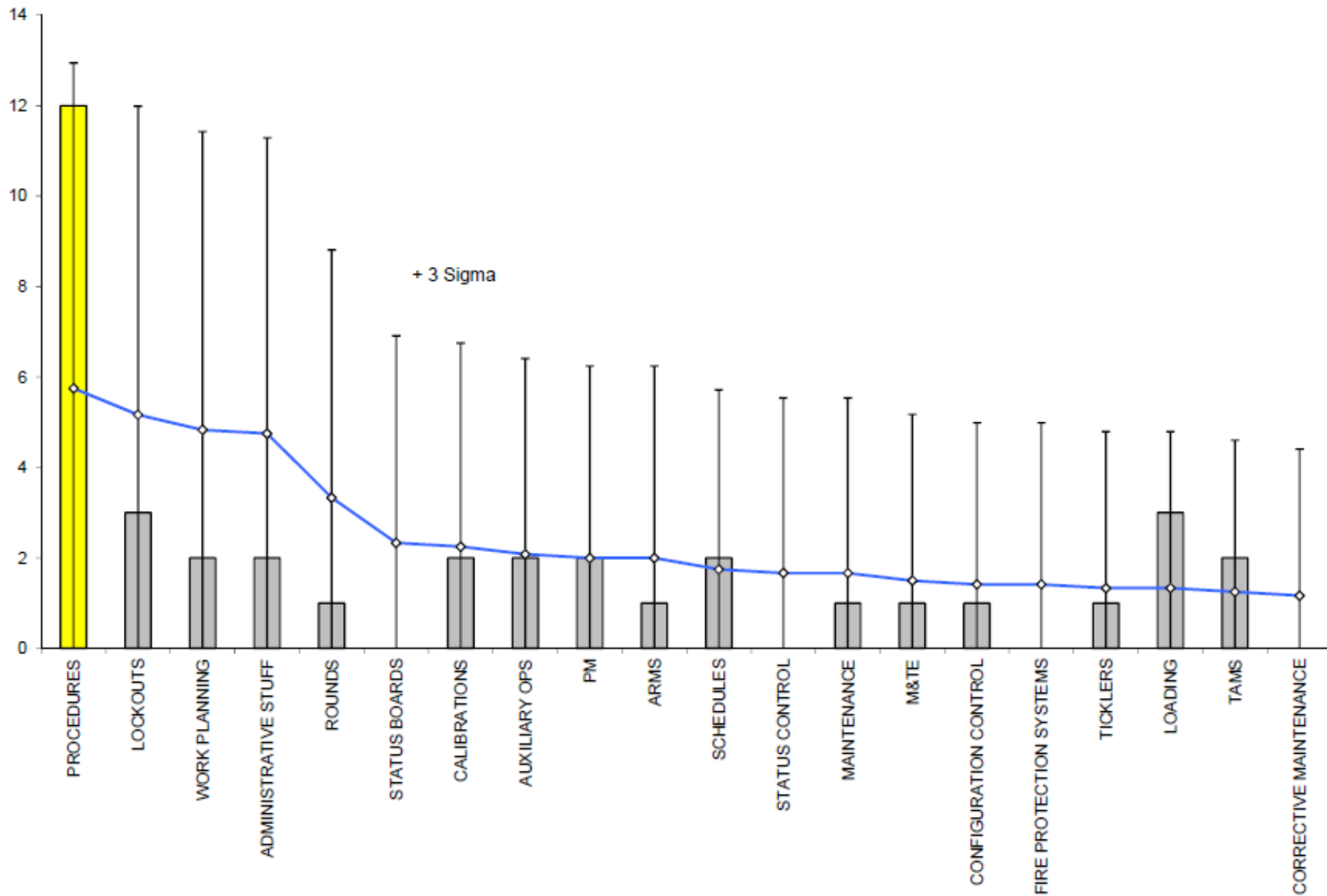


# STAR Flawed Defense Analysis – Sept, 2014





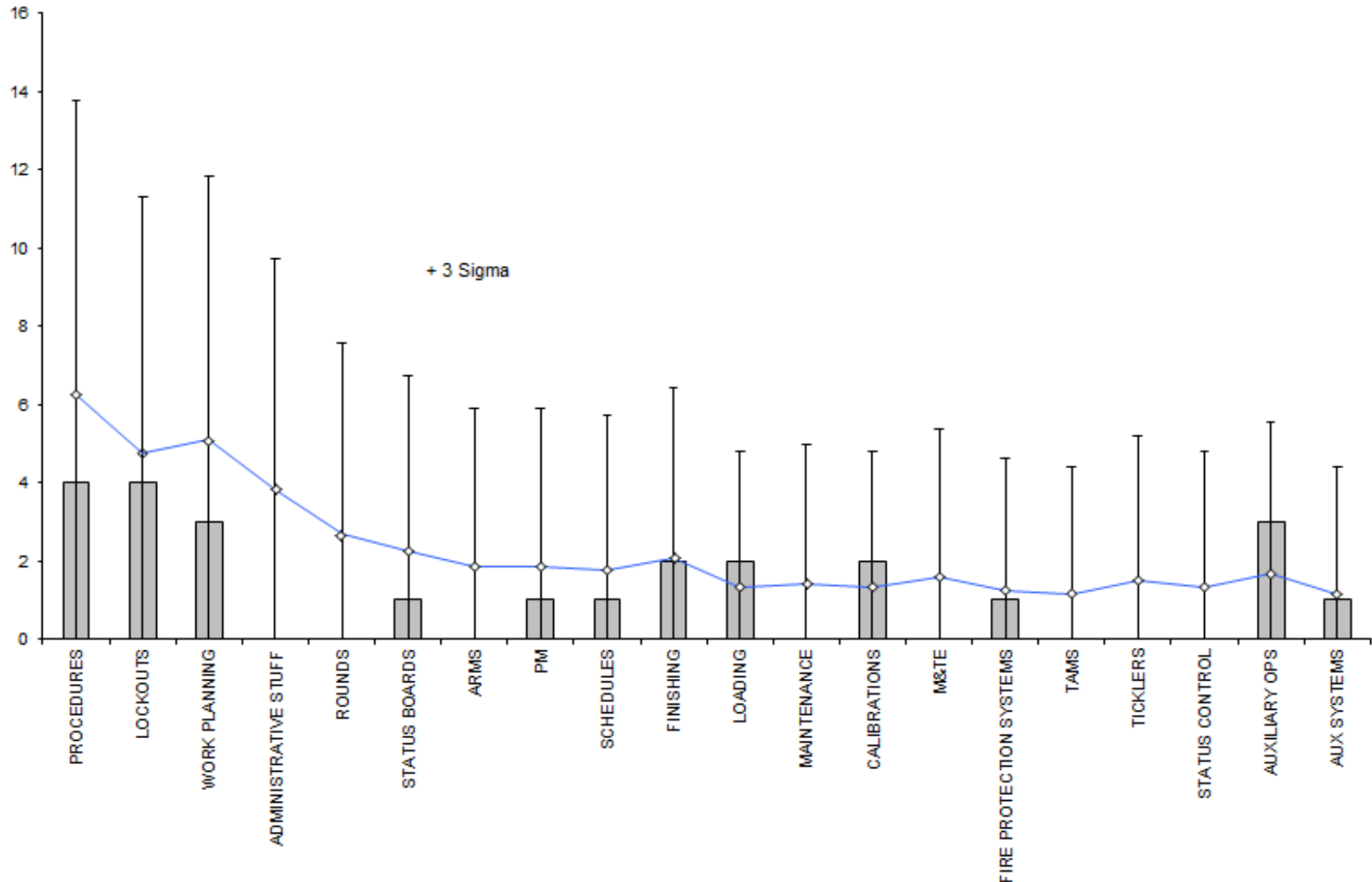
# Tritium Specific Codes - June, 2014



# Tritium Specific Codes - September, 2014

SRTE Chi Square  
Analysis of Error Project Codes  
Top 20 Distribution  
September 14 vs September 13 - August 14

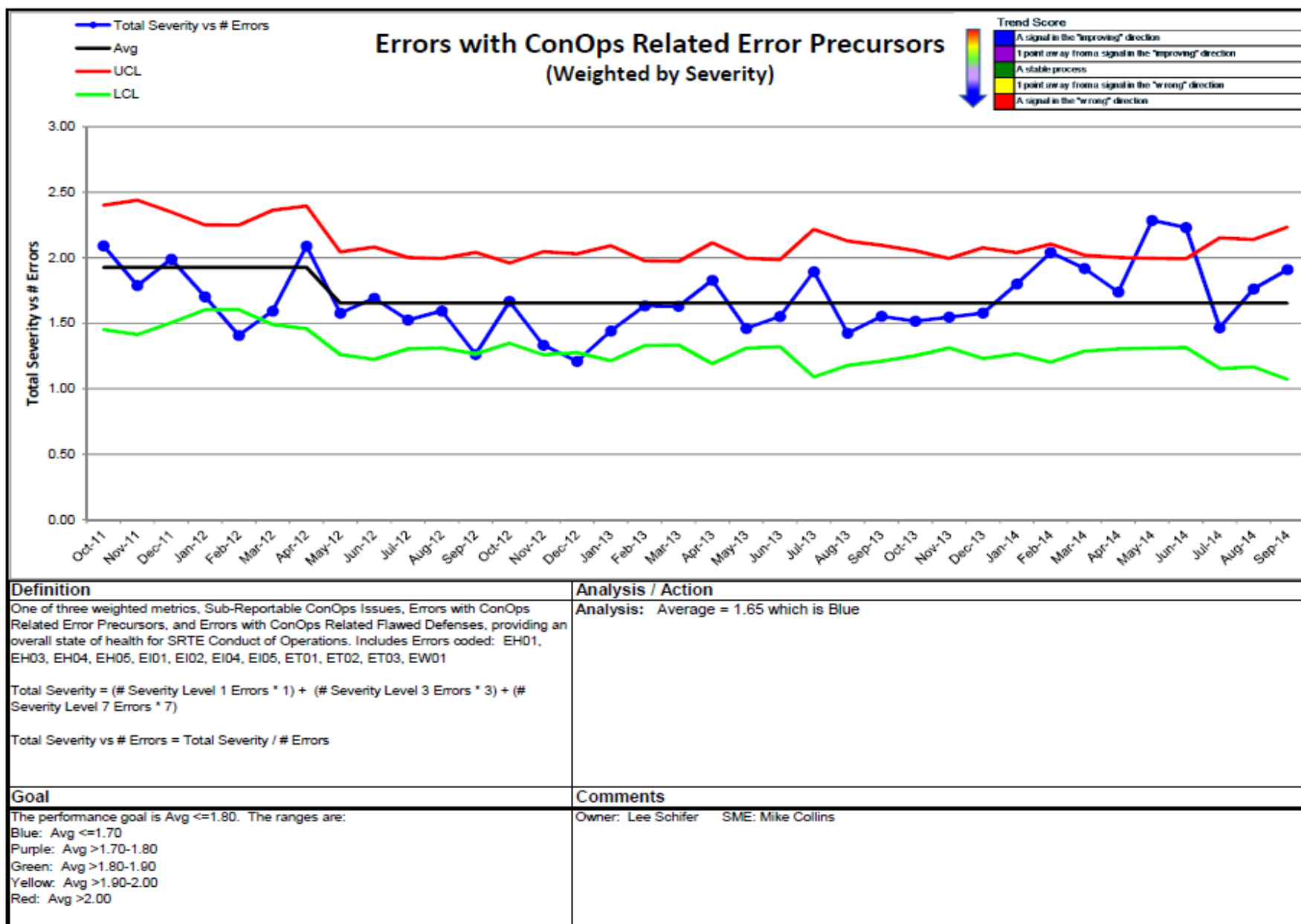
Red = + 3 Sigma from the 12 month distribution  
Yellow = + 2 Sigma from the 12 month distribution  
Gray = Within 2 Sigma from the 12 month distribution  
Green = - 2 Sigma from the 12 month distribution  
Blue = - 3 Sigma from the 12 month distribution



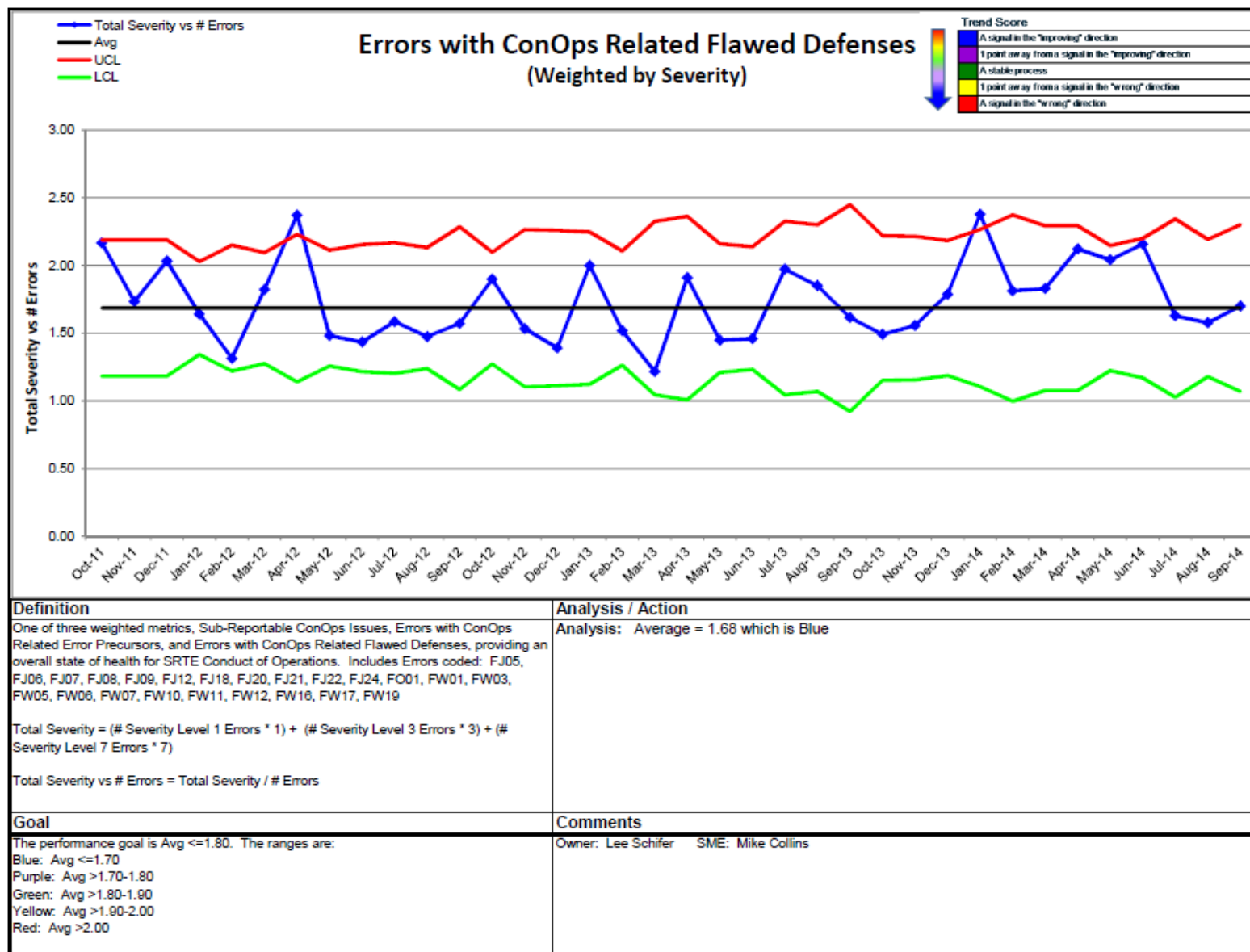


# Results

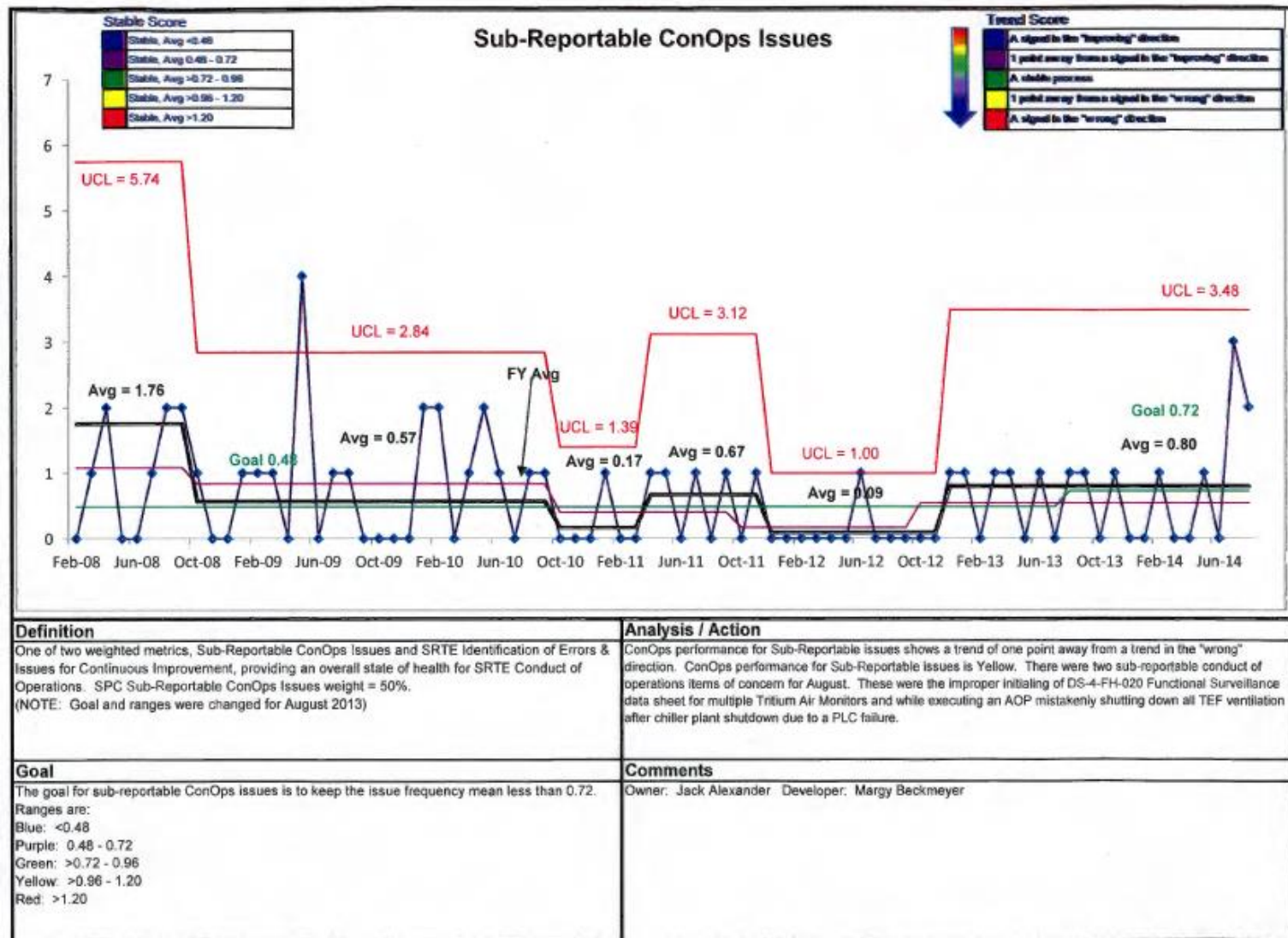
- 1) CY2011 - The identified that a number of errors had been made by newly deployed operators over a three month period. Additional field assistance was provided by supervisors and more experienced operators to reinforce training in specific areas.
- 2) CY2013 - A combination of an increase in errors on Operations Rounds and an increase in TSR near misses prompted management to have face-to-face briefings with operations teams and to send out an e-mail communicating concerns and expectations.
- 3) CY2014 - Increase in error precursors "assumptions" and "overconfidence/complacency" and a drop in the behavior defense, "rigor" (*Completeness and accuracy, strict precision during the performance of an action*) prompted management to deploy Senior Supervisory Oversight for 100 days to reinforce conduct of operations fundamentals.



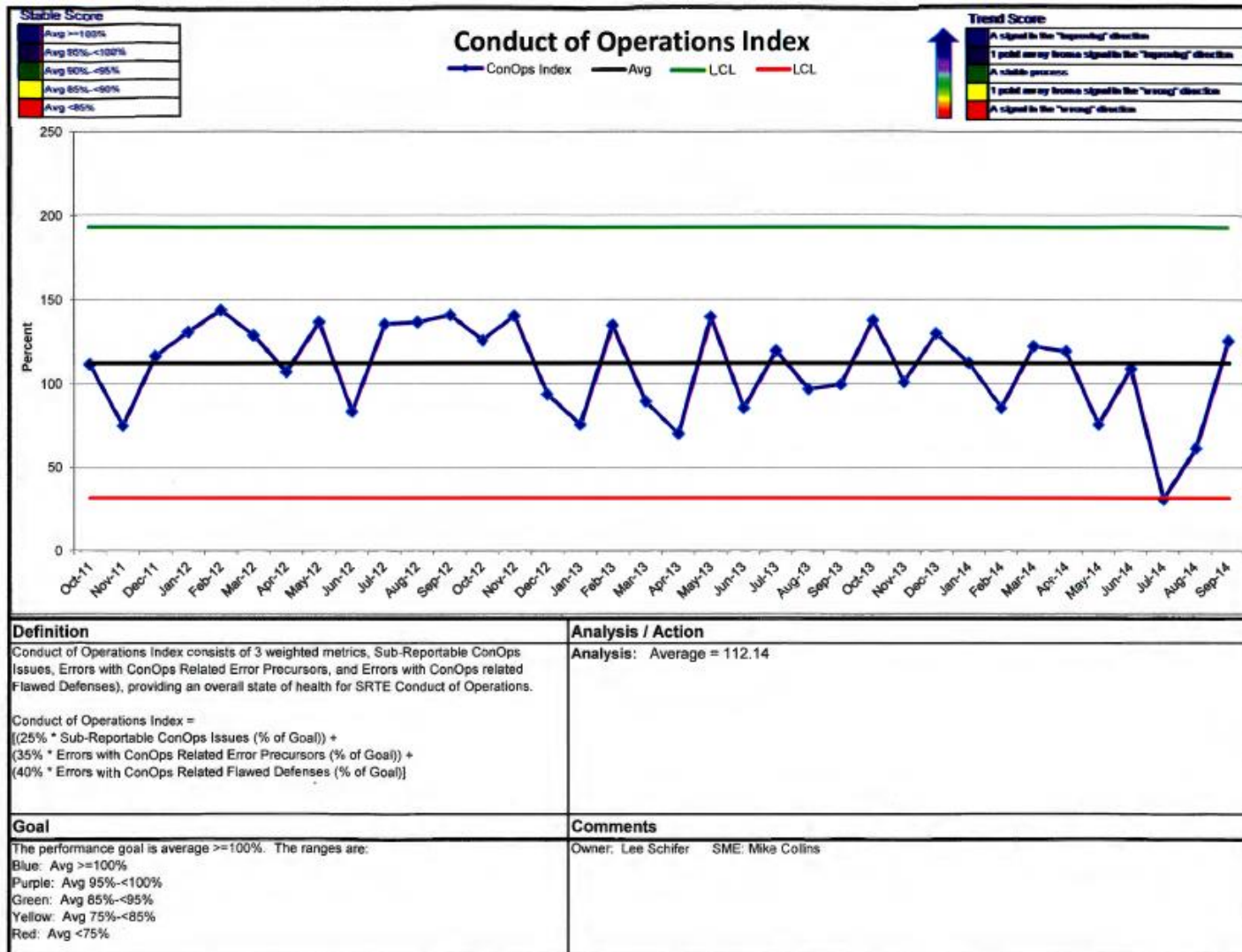




# Sub-Reportable Issues

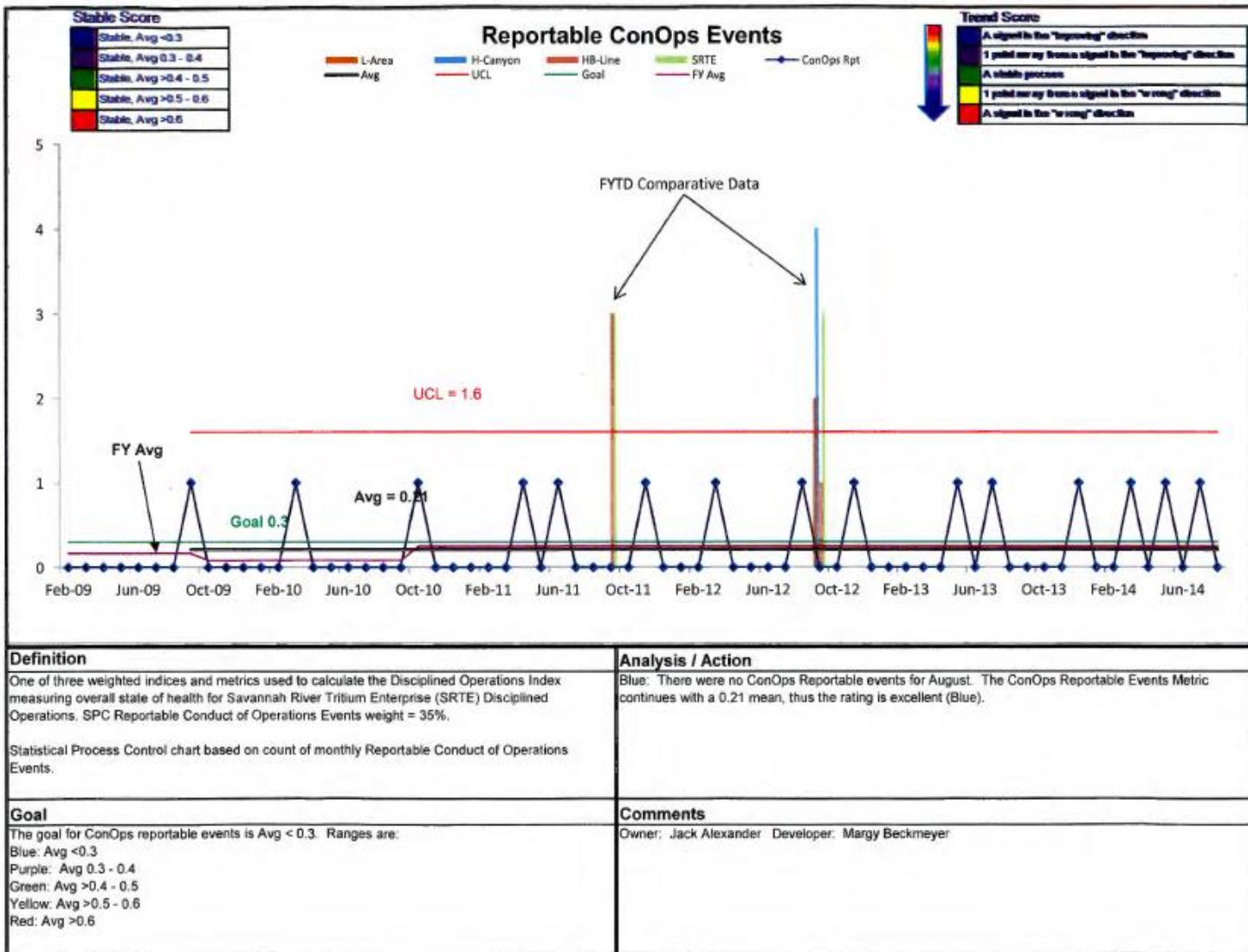


# Conduct of Operations Index

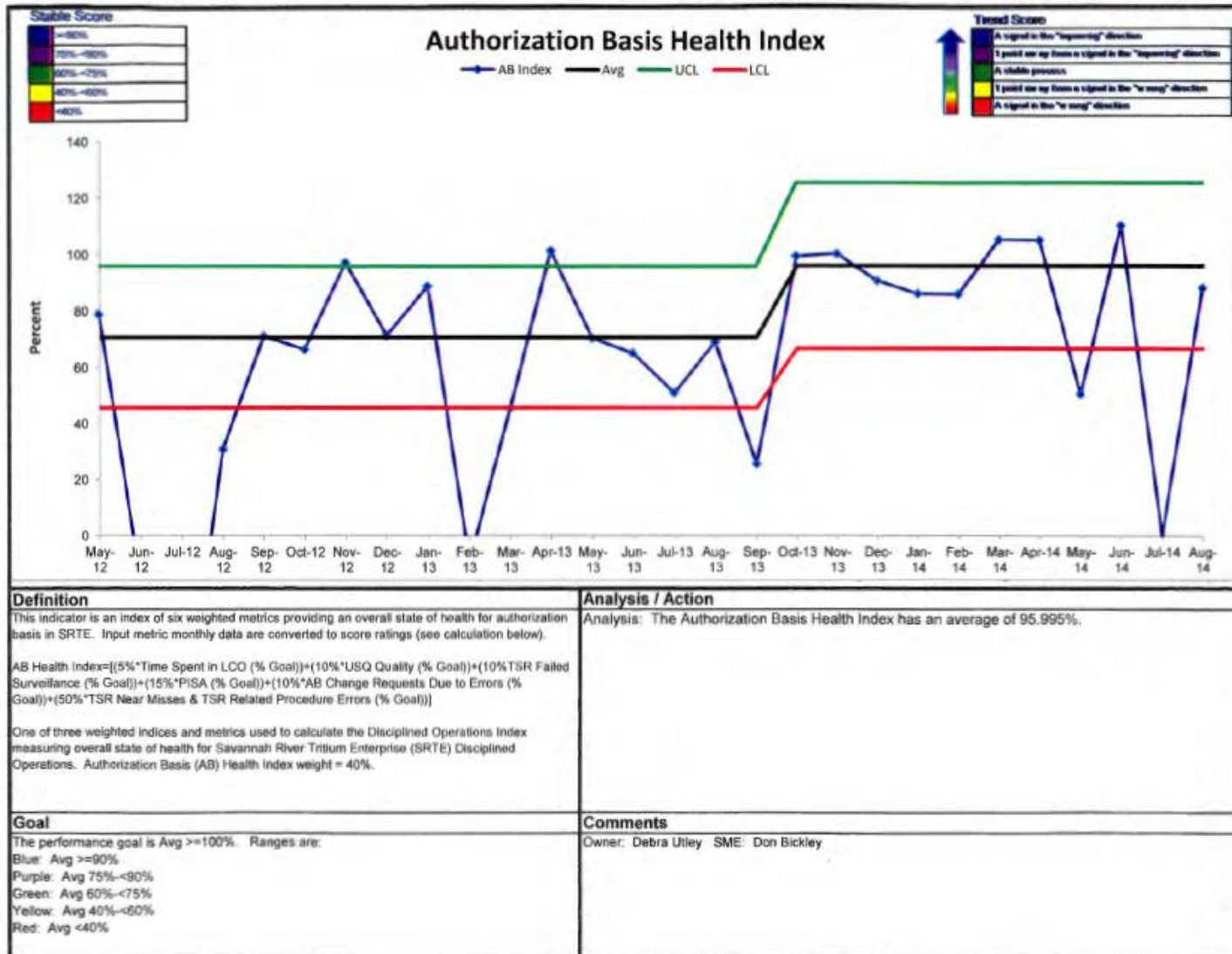




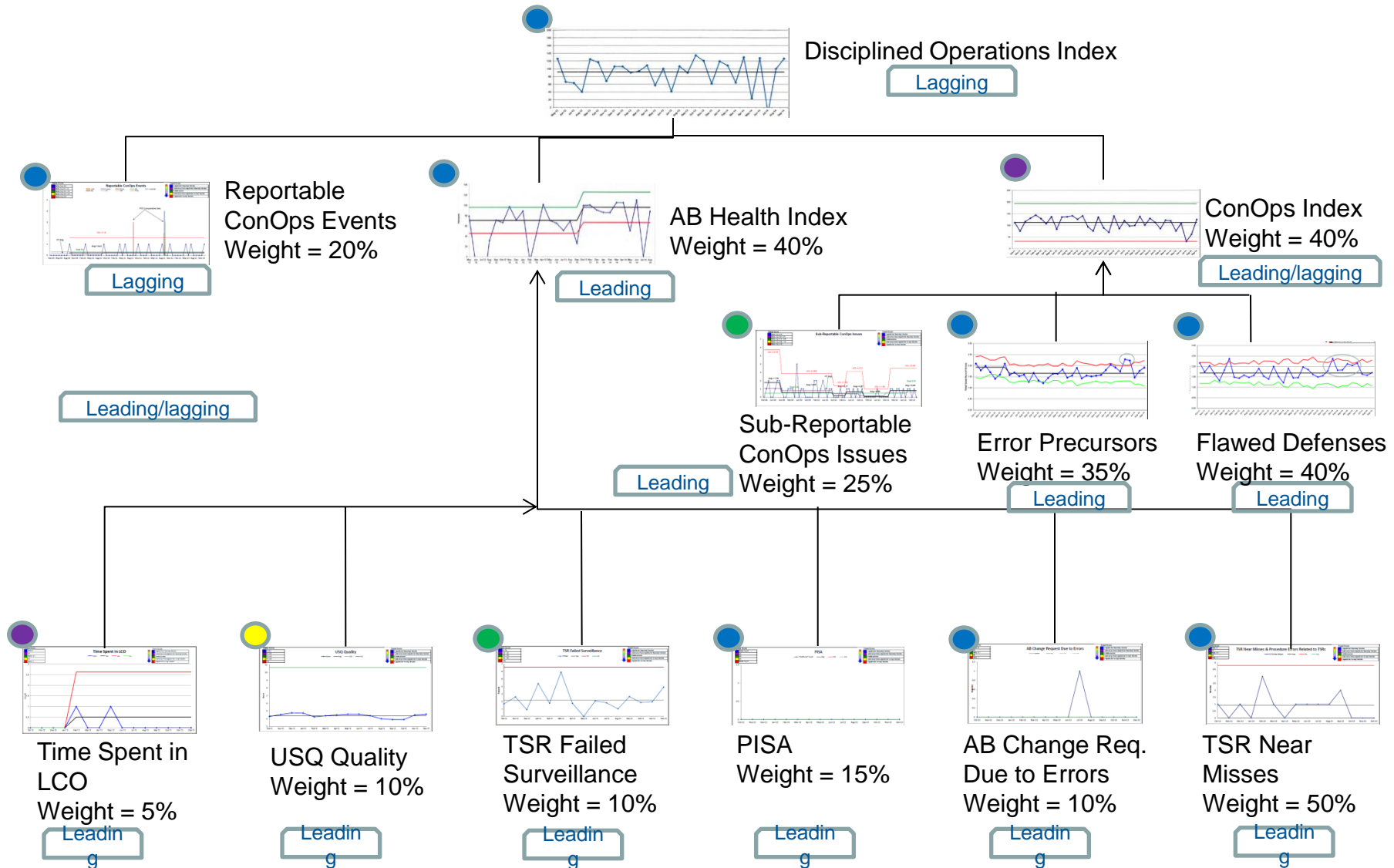
# Reportable Conduct of Operations Events



# Authorization Basis Health Index



# Disciplined Operations Index – Sept. 2014





# Disciplined Operations Index

